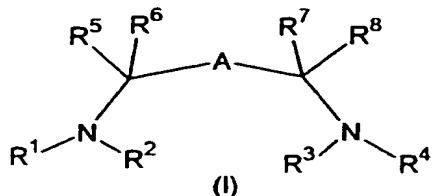


Claims.

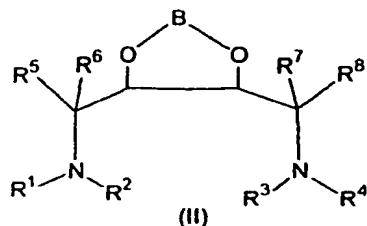
1. A chiral catalyst comprising the reaction product of a ruthenium compound, a chiral bis(phosphine) and a chiral diamine of formula (I)



in which R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup> or R<sup>4</sup> are independently hydrogen, a saturated or unsaturated alkyl, or cycloalkyl group, an aryl group, a urethane or sulphonyl group and R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup> or R<sup>8</sup> are independently hydrogen, a saturated or unsaturated alkyl or cycloalkyl group, or an aryl group, at least one of R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup> or R<sup>4</sup> is hydrogen and A is a linking group comprising one or two substituted or unsubstituted carbon atoms.

2. A catalyst according to claim 1 wherein the chiral bis(phosphine) is P-Phos, tol-P-Phos or xyl-P-Phos.
3. A catalyst according to claim 1 or claim 2 wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup> and R<sup>4</sup> are the same or different and are selected from hydrogen, methyl, ethyl, isopropyl, cyclohexyl, phenyl or 4-methylphenyl groups.
4. A catalyst according to claim 1 or claim 2 wherein R<sup>1</sup> and R<sup>2</sup> are linked or R<sup>3</sup> and R<sup>4</sup> are linked so as to form a 4 to 7-membered ring structure incorporating the nitrogen atom.
5. A catalyst according to any one of claims 1 to 4 wherein R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup> and R<sup>8</sup> are the same or different and are selected from hydrogen, methyl, ethyl, propyl, iso-propyl, butyl, iso-butyl, sec-butyl, tert-butyl, cyclohexyl or substituted or unsubstituted phenyl or naphthyl groups.
6. A catalyst according to any one of claims 1 to 4 wherein one or more of R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup> or R<sup>8</sup> form one or more ring structures with the linking group A.
7. A catalyst according to any one of claims 1 to 6 wherein a substituting group on the carbon atom of linking group A is alkyl (C1-C20), alkoxy (C1-C20) or amino or forms one or more ring structures incorporating one or more carbon atoms making up the linking group.

8. A catalyst according to claim 1 or claim 2 wherein the chiral diamine is of formula (II)

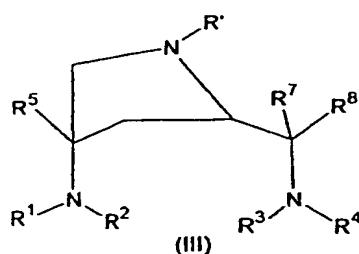


wherein B is a linking group comprising one or two substituted or unsubstituted carbon atoms.

9. A catalyst according to claim 8 wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> are hydrogen, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup> and R<sup>8</sup> are hydrogen or alkyl groups and B comprises C(CH<sub>3</sub>)<sub>2</sub> or (CH<sub>3</sub>)(OCH<sub>3</sub>)C-C(CH<sub>3</sub>)(OCH<sub>3</sub>).

10. A catalyst according to claim 8 or claim 9 wherein the chiral diamine is selected from 3-Aminomethyl-5,6-dimethoxy-5,6-Dimethyl[1,4]-dioxan-2-yl-methylamine (DioBD) or 2,3-O-isopropylidenebutane 1,4 diamine (DAMTAR).

11. A catalyst according to claim 1 or claim 2 wherein the chiral diamine is of formula (III)

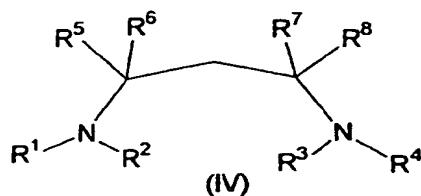


wherein R' is a protecting group.

12. A catalyst according to claim 11 wherein R<sup>1</sup>, R<sup>2</sup> and R<sup>5</sup> are hydrogen, R<sup>3</sup> and R<sup>4</sup> are hydrogen or alkyl, R<sup>7</sup> and R<sup>8</sup> are hydrogen, alkyl or aryl and R' is selected from an alkyl, aryl, carboxylate, amido or sulphonate protecting group.

13. A catalyst according to claim 11 or claim 12 wherein the chiral diamine is 4-Amino-2-aminomethylpyrrolidine-1-carboxylic acid *tert*-butyl ester (PyrBD).

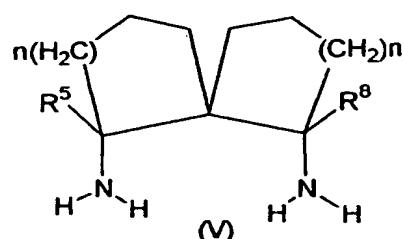
14. A catalyst according to claim 1 or claim 2 wherein the chiral diamine is of formula (IV)



15. A catalyst according to claim 14 wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^6$ ,  $R^7$  are hydrogen and  $R^5$  and  $R^8$  are aryl or substituted aryl groups.

16. A catalyst according to claim 14 or claim 15 wherein the chiral diamine is Diphenyl-1,3-propanediamine (Dppn).

17. A catalyst according to claim 1 or claim 2 wherein the chiral diamine is of formula (V).



wherein  $n = 1$  or  $2$ .

18. A catalyst according to claim 17 wherein  $R^5$  and  $R^8$  are hydrogen.

19. The use of catalysts of claims 1 to 18 for the asymmetric hydrogenation of ketones and imines.

20. The use of catalysts according to claim 19 for the hydrogenation of alkyl ketones of formula  $RCOR'$  in which  $R$  and  $R'$  are substituted or unsubstituted, saturated or unsaturated C1-C20 alkyl or cycloalkyl which may be linked and form part of a ring structure.